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Length Composition Comparisons of USA and Canadian Fishery Catches for Atlantic Cod, Haddock and Yellowtail Flounder

S. Gavaris[1], R. Mayo[2], J. Brodziak[2], J. Hunt[1], C. Legault[2], L. O'Brien[2], H. Stone[1] and L. Van Eeckhaute[1]

[1]Fisheries and Oceans Canada
531 Brandy Cove Road
St. Andrews, New Brunswick E5B 3L9
Canada

[2]NOAA/NMFS Northeast Fisheries Science Center
166 Water Street
Woods Hole, Massachusetts 02543-1097
USA

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ABSTRACT

Length compositions of USA and Canadian landings, discards, and total catches of Atlantic cod, haddock and yellowtail flounder from the USA/Canada shared management area on eastern Georges Bank from 1997-2004 were compared. Due to limited sampling, comparisons for some stocks could not be performed in all years. There are notable differences in the length compositions of discards. USA discards are attributed to groundfish and sea scallop fisheries. In the USA groundfish fisheries on George Bank, discarding is associated with size culling. Canadian discards are attributed almost exclusively to the Canadian sea scallop fishery where they are required to discard all cod, haddock and yellowtail flounder, regardless of size. In general, estimated discards in both the USA and Canadian fisheries were low relative to landings and have had only a nominal effect on the length composition of the catches.

On average, the length compositions of the cod catches were similar for USA and Canada, whereas for haddock, a higher proportion of small and large fish are caught by the USA fishery while the catch in the Canadian fishery is more peaked at medium size. The length compositions of yellowtail flounder catch indicate that a higher proportion of small fish are caught in the Canadian fishery. On balance, the differences in length composition between USA and Canadian catches of Atlantic cod, haddock and yellowtail flounder were small relative to the length range spanned by any age; therefore, the implications for conservation or yield are expected to be nominal. Low sampling, differences in discarding practices and the absence of direct comparisons during the same time of year and in the same area preclude any definitive interpretation that these marginal differences might be due to gear selectivity.

RÉSUMÉ

Nous comparons la composition selon la longueur des débarquements, des rejets et des prises totales de morue, d'aiglefin et de limande à queue jaune par les pêcheurs canadiens et américains dans la zone de gestion partagée entre les deux pays et située dans la partie est du banc Georges de 1997 à 2004. En raison d'un échantillonnage limité, certaines comparaisons de stocks n'ont pu être effectuées pour certaines années. Il existe des différences importantes sur le plan de la composition des rejets selon la longueur. Les rejets par les pêcheurs américains sont attribuables aux pêches de poissons de fond et du pétoncle géant. Dans le cadre des pêches américaines de poissons de fond sur le banc Georges, les rejets sont liés au tri en fonction de la taille. Les rejets par les pêcheurs canadiens sont attribuables presque exclusivement à la pêche canadienne du pétoncle géant, dans le cadre de laquelle les pêcheurs sont tenus de rejeter les morues, les aiglefins et les limandes à queue jaune de toute taille. En général, les estimations des rejets par les pêcheurs canadiens et américains sont faibles par rapport aux débarquements, et les rejets n'ont eu qu'un effet peu important sur la composition des prises selon la longueur.

En moyenne, la composition des prises canadiennes de morue selon la longueur est semblable à celle des prises américaines de morue. Cependant, dans le cas de l'aiglefin, les prises américaines sont constituées d'une plus grande proportion de poissons de petite et de grande tailles, tandis que les prises canadiennes sont principalement constituées de poissons de taille moyenne. La composition des prises de limande à queue jaune selon la longueur indique qu'une plus grande proportion de poissons de petite taille sont capturés dans le cadre des pêches canadiennes. Dans l'ensemble, les différences en composition selon la longueur entre les prises canadiennes et américaines de morue, d'aiglefin et de limande à queue jaune sont petites par rapport à la gamme de longueurs de tout âge. Par conséquent, les répercussions sur la

conservation ou le rendement devraient être peu importantes. Un faible taux d'échantillonnage, des différences sur le plan des pratiques de rejet et l'absence de comparaisons directes à la même période de l'année et dans une même zone empêchent toute interprétation définitive voulant que ces légères différences pourraient être dues à la sélectivité des engins.

Introduction

Gavaris and Murawski (2004) provide an account of the considerations regarding consistent management between Canada and the USA for the transboundary resources of Atlantic cod, haddock and yellowtail flounder on Georges Bank. The Transboundary Management Guidance Committee reached agreement on a sharing proposal (DFO 2002), in which national allocation shares are based on total catch in tonnage. Differences in length composition of USA and Canadian fishery catches may potentially have conservation or yield implications. The purpose of this paper is to investigate and document any differences in length compositions in the USA and Canadian fishery catches (landings and discards) of the three groundfish species on George Bank. Subsequent analyses may be required to probe the source of any differences that raise concerns.

Data and Methods

Atlantic cod, haddock and yellowtail flounder on Georges Bank are predominantly caught in the USA multispecies fishery, the USA sea scallop fishery, the Canadian groundfish fishery and the Canadian sea scallop fishery. USA fishery regulations include minimum size provisions, resulting in discarding under-sized fish, and more recently, trip limit provisions, resulting in discarding of both under-sized and legal-sized fish. Discarding of groundfish is not permitted in the Canadian groundfish fishery and since 1996, all cod, haddock and yellowtail flounder caught in the Canadian sea scallop fishery must be discarded.

USA fisheries are sampled upon landing for length composition. Samples are stratified by market category and season, and subsequently combined. At-sea sampling is not used to characterize the length composition of landings because the fish are typically not sorted by market category at this stage. At-sea samples are used to characterize the length composition of discards.

Canadian fisheries are also sampled upon landing for length composition. Virtually all landings are unculled for size. Samples are stratified by gear and season, and subsequently combined. Since landings are not sorted by size, at-sea sampling is used to augment port sampling. At-sea samples are used to characterize the length composition of discards from the scallop fishery.

Results

There are notable differences in the length compositions between USA and Canadian discards. USA discards are attributed to the groundfish and sea scallop fisheries. In the groundfish fisheries in particular, discarding is associated with size culling and trip limits. Canadian discards are attributed almost exclusively to the Canadian George Bank sea scallop fishery where they are required to discard all cod, haddock and yellowtail flounder, regardless of size. In general, estimated discards for both USA and Canadian fisheries were low relative to landings and have had only a nominal effect on the length composition of the catches.

Cod

Sampling of the Canadian landings was considered adequate and representative for all years (Table 1). Sampling of the USA landings from eastern Georges Bank was considered insufficient since 1996, and sampling from the entire Georges Bank (i.e. eastern and

western Georges Bank) was used. Sampling of USA discards was limited for 1997-2001, but discard amounts were also low in these years. For the 1997-2004 period, sampling of Canadian discards was lacking in all but two years. Therefore, the Canadian sea scallop fishery discard length compositions were based on survey results adjusted for scallop fishery selectivity.

On average, the length compositions of the cod catches are similar for USA and Canada with slightly smaller-sized cod in the USA catch (Figures 1-3). The high percentage of the USA catch at length 73 cm in 2004 is considered a sampling artifact. The length compositions are remarkably similar in many years. A notable difference is the lower proportion of fish below 55 cm in the USA catch in 2003 and 2004. This could be due to differences in availability of small cod on the USA and Canadian sides of the Bank, gear selectivity differences between the two countries and/or potential underestimation of USA discards. The horizontal separation of the cumulative catch distributions of the two countries was never greater than 3 cm and generally less. The observed differences in length composition were small in relation to the length range encompassing 80% of the cod at each of ages 3, 4, 5 and 6 (Figure 3 lower right panel).

Haddock

Sampling of USA and Canadian landings was considered adequate and representative during 2001-2004 (Table 2). Due to low catches, sampling of USA landings and discards in 1997-2000 was considered inadequate to characterize the length composition. For the 1997-2004 period, sampling for Canadian discards was lacking in all but two years. Canadian scallop fishery discard length frequencies obtained by at-sea observers, where available, were compared to survey and groundfish fishery length frequencies. It was determined that the average of the DFO and NMFS spring survey, truncated to exclude haddock below 16.5 cm, would adequately characterize the discard length composition for the first half of 1997 to 2004. Similarly, the NMFS fall survey, truncated to exclude haddock below 16.5 cm, would adequately characterize the discard length composition for the second half of 1997 to 2003. At-sea samples were available for the second half of 2004.

On average, the haddock catch length compositions indicate that a higher proportion of small and large fish is caught by the USA fishery while the Canadian fishery catch is more peaked at medium size (Figures 4-6). This pattern is not consistent over years and there are not many years for comparison. As with cod, there is a lower proportion of smaller haddock in the USA catches during 2003 and 2004. The disparity could be due to difference in availability of medium sized haddock on the USA and Canadian sides of the Bank, gear selectivity differences between the two countries, and/or perhaps unrepresentative sampling of USA discards. The horizontal separation of the cumulative USA and Canadian catch distributions (excluding small fish which were influenced by discards) was about 5 cm at its greatest. The observed differences in length compositions are small in relation to the length range encompassing 80% of the haddock at each of ages 3, 4, 5 and 6 (Figure 6 lower right panel).

Yellowtail Flounder

Sampling for USA and Canadian landings was considered adequate and representative during all years (Table 3). Sampling of USA discards was also considered adequate and representative in all years. During the 1997-2004 period, sampling for Canadian discards

only occurred in three years. For the remaining years, the Canadian sea scallop fishery discard length compositions were based on survey results adjusted for scallop fishery selectivity.

On average, the length compositions of the USA and Canadian yellowtail catches indicate that a higher proportion of small fish is caught by the Canadian fishery (Figures 7-9). This pattern is most apparent in recent years. The discrepancy in the catches of small fish in 1998 is perhaps the most unusual pattern. This disparity could be due to difference in availability of different sizes of yellowtail flounder on the USA and Canadian sides of the Bank, and/or gear selectivity differences between the two countries. The horizontal separation of the cumulative catch distributions of the two countries was never greater than 3 cm and generally less. The observed differences in length composition are small in relation to the length range encompassing 80% of the yellowtail flounder at each of ages 2, 3, 4 and 5 (Figure 9 lower right panel).

Discussion

On balance, the differences in length composition between USA and Canadian catches of Atlantic cod, haddock and yellowtail flounder have been small relative to the length range spanned by the principal age groups caught in the fisheries. Therefore, the implications for conservation or yield are expected to be nominal. Cod and haddock are typically caught together in the same fisheries. The occurrence of somewhat larger cod in conjunction with fewer large haddock in the Canadian fishery relative to the USA fishery suggests a complex interaction exists between the size specific spatial/temporal distributions of cod and haddock and the location/time of fishing activities. Low sampling intensity, differences in discarding practices, and the absence of direct comparisons between size composition data obtained during the same time of year and in the same area preclude any definitive interpretation that any of the marginal differences in the size composition of the catches of the two countries might be due to gear selectivity.

References

DFO 2002. Development of a sharing allocation proposal for transboundary resources of cod, haddock and yellowtail flounder on Georges Bank. DFO Maritime Provinces, Regional Fisheries Management Report 2002/01: 59 p. http://www.mar.dfo-mpo.gc.ca/science/tmgc/background/FMR_202002_01.pdf

Gavaris, S. and S. A. Murawski. 2004. The role and determination of residence proportions for fisheries resources across political boundaries: the Georges Bank example. pp. 261- 278. In: Payne, A.I.L., C.M. O'Brien and S.I. Rogers [eds.] Management of shared fish stocks. Blackwell. Oxford, UK.

Table 1. Number of length measurements used to derive length compositions for Atlantic cod.

	Canada landed			USA landed		
Year	# lengths	Landed t	#lengths/200t	# lengths[1]	Landed t	#lengths/200t
1997	31882	2919	2184	6638	557	2383
1998	26549	1907	2784	7076	795	1780
1999	24954	1818	2745	6045	1150	1051
2000	20782	1572	2644	12219	662	3692
2001	18190	2137	1702	8389	1361	1233
2002	18974	1279	2967	6306	1379	915
2003	20199	1325	3049	2785	1813	307
2004	17859	1111	3215	1872	980	382

	Canada discard			USA discard		
Year	# lengths	Discard t	#lengths/200t	# lengths	Discard t	#lengths/200t
1997	[2]	496		28	1.2	4667
1998	[2]	396		30	2.2	2727
1999	[2]	351		12	7.9	304
2000	[2]	73		43	10.9	789
2001	597[2]	143	835	1	83.3	2
2002	396[2]	94	843	129	37	697
2003	[2]	200		543	87	1248
2004	[2]	145		809	73.7	2195

[1] includes length samples from western Georges Bank
[2] length composition based on survey results adjusted for scallop fishery selectivity

Table 2. Number of length measurements used to derive length compositions for haddock.

	Canada landed			USA landed		
Year	# lengths	Landed t	#lengths/200t	# lengths	Landed t	#lengths/200t
1997	32531	2749	2367	108[1]	48	450
1998	65672	3371	3896	110[1]	311	71
1999	79069	3681	4296	212[1]	355	119
2000	68469	5402	2535	567[1]	187	606
2001	67905	6712	2023	1556	608	512
2002	46802	6499	1440	1227	916	268
2003	69398	6789	2044	3485	1563	446
2004	77038	9745	1581	3825	1796	426

	Canada discard			USA discard		
Year	# lengths	Discard t	#lengths/200t	# lengths	Discard t	#lengths/200t
1997	132[2]	60	N/A		63	
1998	[2]	102	N/A		14	
1999	[2]	49	N/A			
2000	[2]	29	N/A			
2001	311[2]	39	N/A	152[3]	40	760
2002	232[2]	29	N/A	382[3]	35	2183
2003	[2]	98	N/A	262[3]	63	832
2004	1st half [2]	36	N/A	1053[3]	156	1350
	2nd half 1075	57	3772			

[1] insufficient to characterize length composition
[2] length composition based on survey results adjusted for scallop fishery selectivity
[3] includes length samples from western Georges Bank

Table 3. Number of length measurements used to derive length compositions for yellowtail flounder.

	Canada landed			USA landed		
Year	# lengths	Landed t	#lengths/200t	# lengths	Landed t	#lengths/200t
1997	6370	810	1573	1745	966	361
1998	5823	1175	991	1392	1822	153
1999	4944	1971	502	1908	1987	192
2000	23825	2859	1667	2762	3678	150
2001	7471	2913	513	4042	3792	213
2002	14498	2642	1098	3081	2532	243
2003	11908	2107	1130	4877	3343	292
2004	2963	96	6173	7953	6208	256

	Canada discard			USA discard		
Year	# lengths	Discard t	#lengths/200t	# lengths	Discard t	#lengths/200t
1997	[1]	438		931	58	3233
1998	[1]	708		516	116	890
1999	[1]	597		2851	484	1179
2000	[1]	415		32673[2]	408	16008
2001	9559	815	2346	3858[3]	337	2290
2002	6500	493	2637	571	248	460
2003	[1]	809		2242	373	1202
2004	4723	422	2238	10150	549	3695

[1] length composition based on survey results adjusted for scallop fishery selectivity
[2] 31,763 of the lengths were from the Closed Area II sea scallop fishery
[3] 3,712 of the lengths were borrowed from 1998-2000

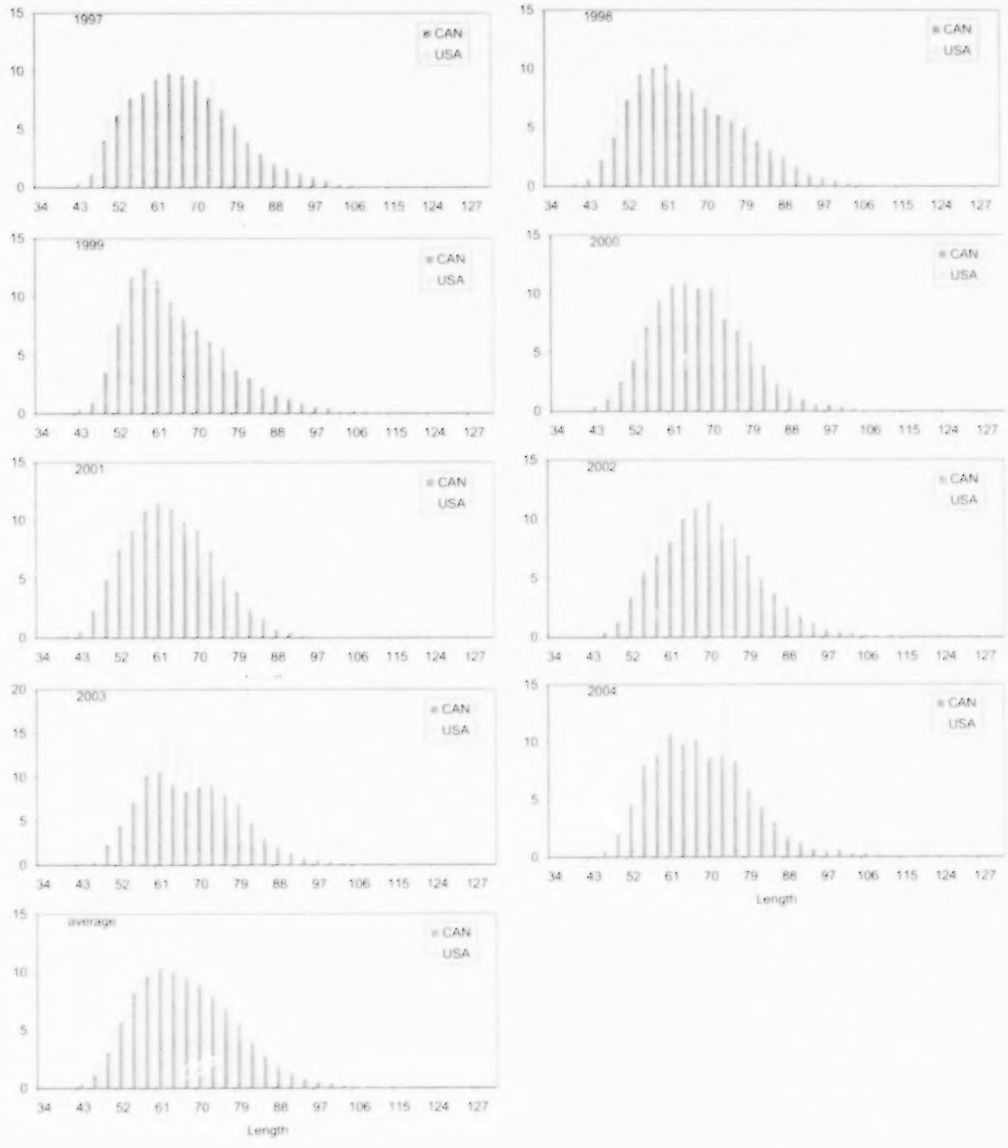

Figure 1. Comparison of the cod landings at size by Canada and USA on eastern Georges Bank for 1997-2004. The average landings at size are displayed in the bottom left panel.

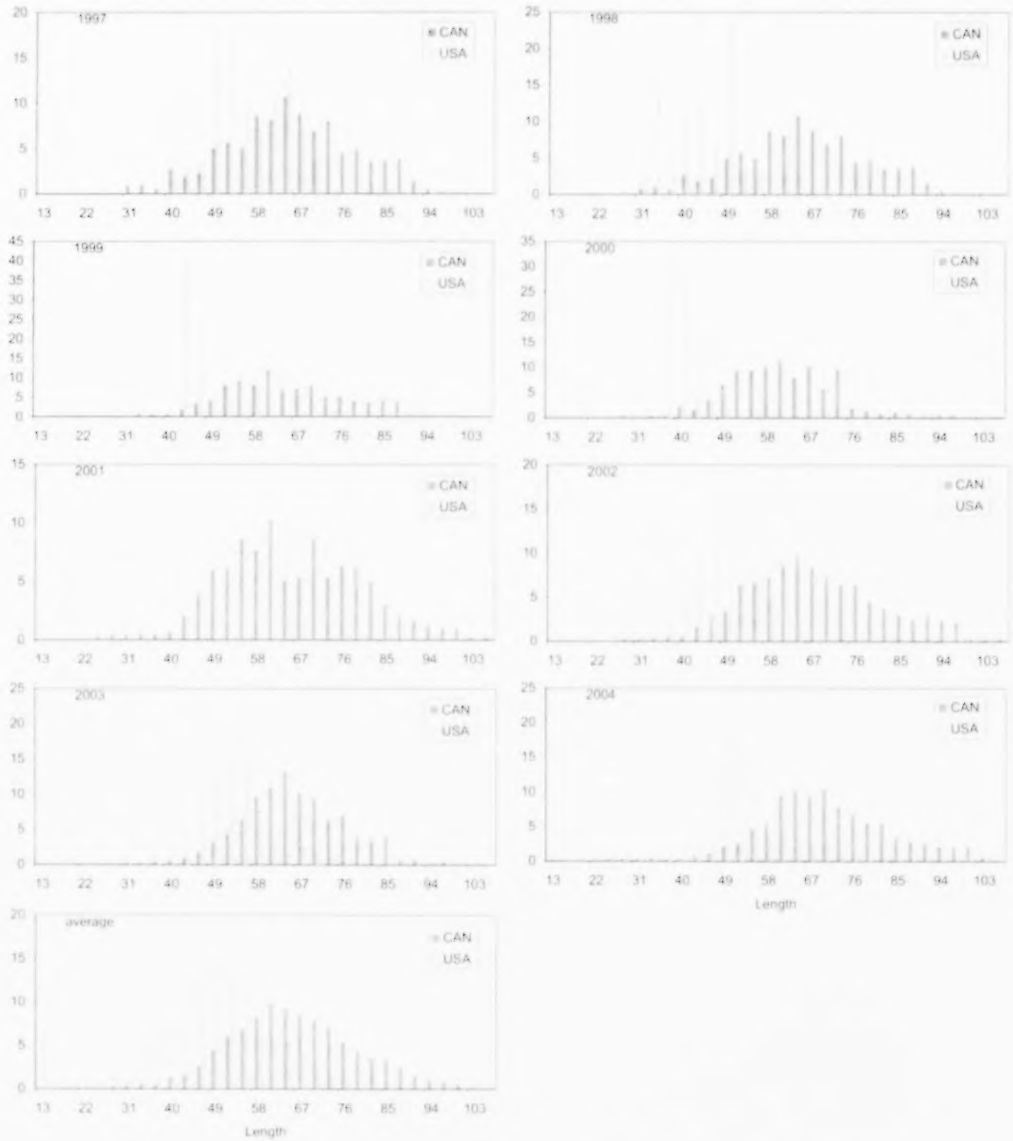

Figure 2. Comparison of the cod discards at size by Canada and USA on eastern Georges Bank for 1997-2004. The average discards at size are displayed in the bottom left panel.

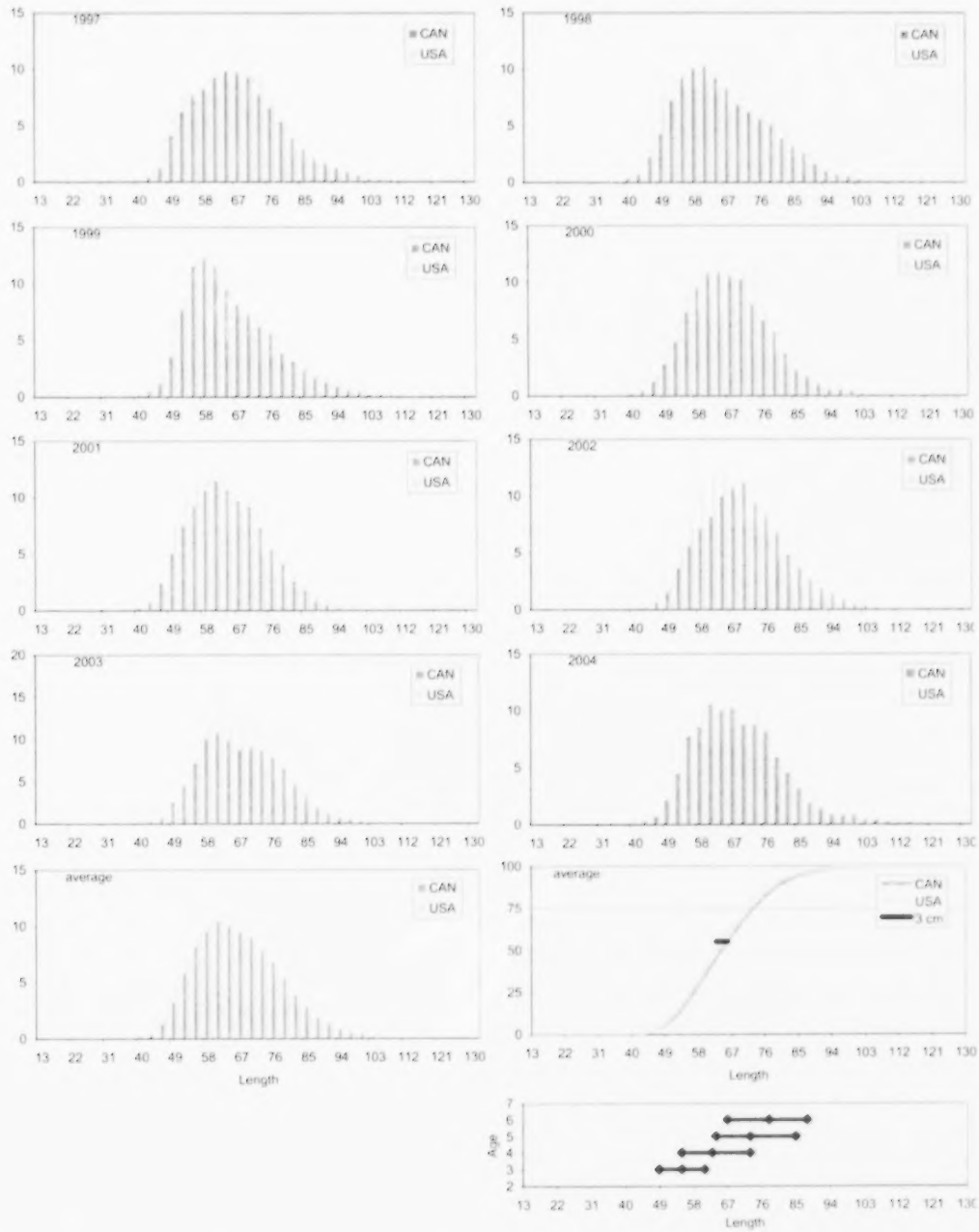

Figure 3. Comparison of the cod catch at size by Canada and USA on eastern Georges Bank for 1997-2004. The average catch at size and the average cumulative catch at size over these years are displayed in the bottom panels. To provide context for the potential implications on fishing mortality at age, the lower right panel shows the length range encompassing 80% of the cod at each of ages 3-6 for the 3rd quarter in 2005.

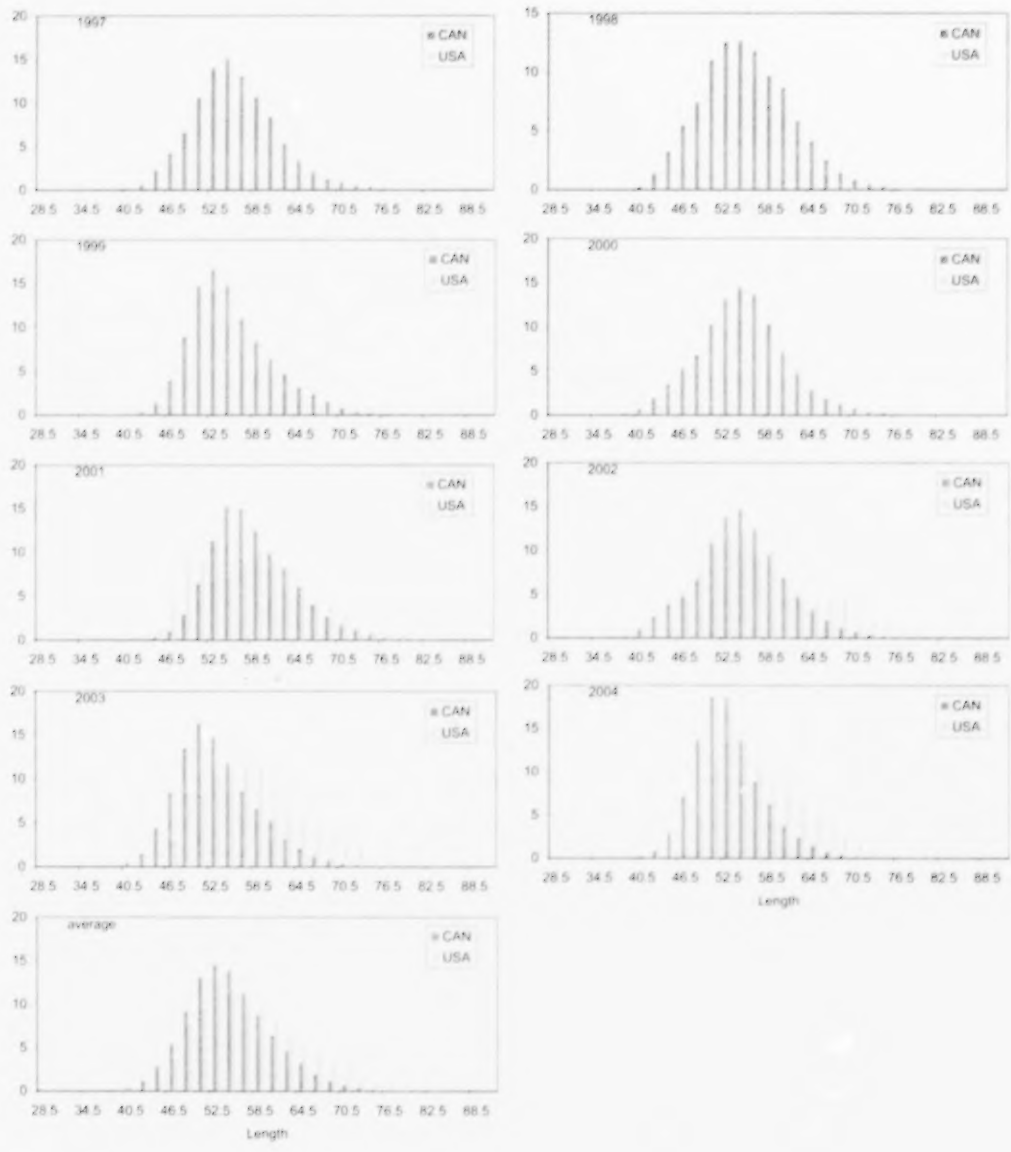

Figure 4. Comparison of the haddock landings at size by Canada and USA on eastern Georges Bank for 1997-2004. The average landings at size are displayed in the bottom left panel.

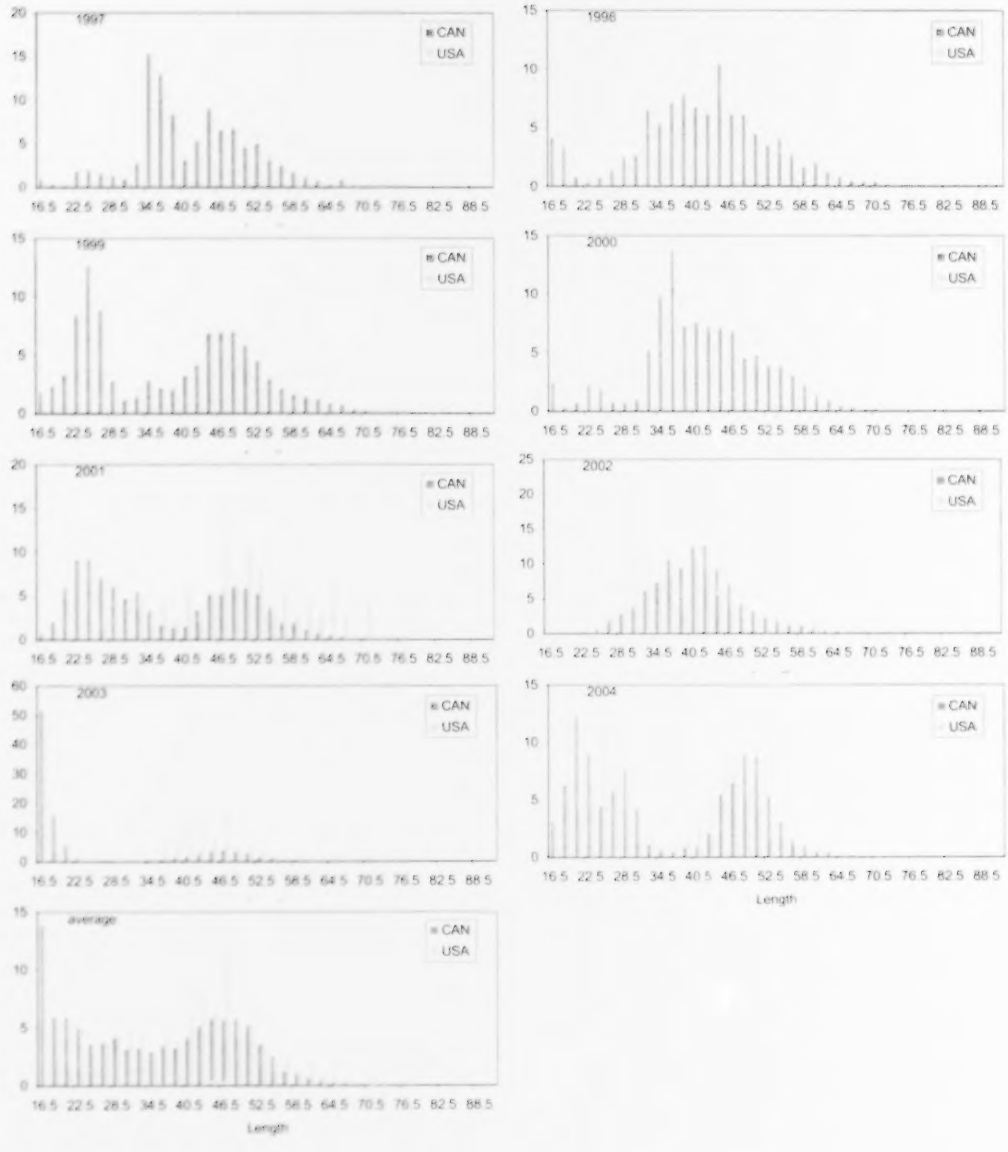

Figure 5. Comparison of the haddock discards at size by Canada and USA on eastern Georges Bank for 1997-2004. The average discards at size are displayed in the bottom left panel.

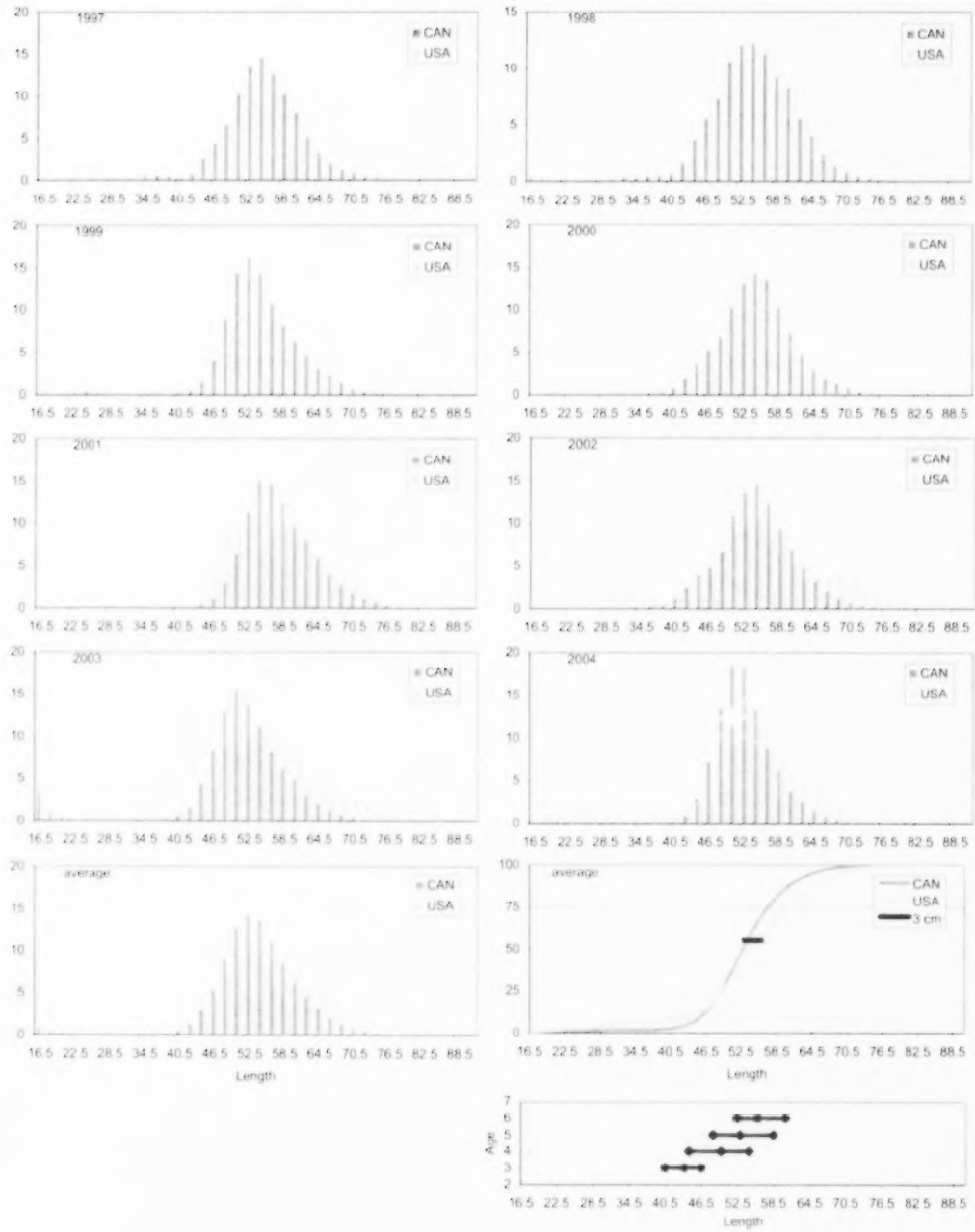

Figure 6. Comparison of the haddock catch at size by Canada and USA on eastern Georges Bank for 1997-2004. The average catch at size and the average cumulative catch at size over these years are displayed in the bottom panels. To provide context for the potential implications on fishing mortality at age, the lower right panel shows the length range encompassing 80% of the cod at each of ages 3-6 for the 3rd quarter in 2005.

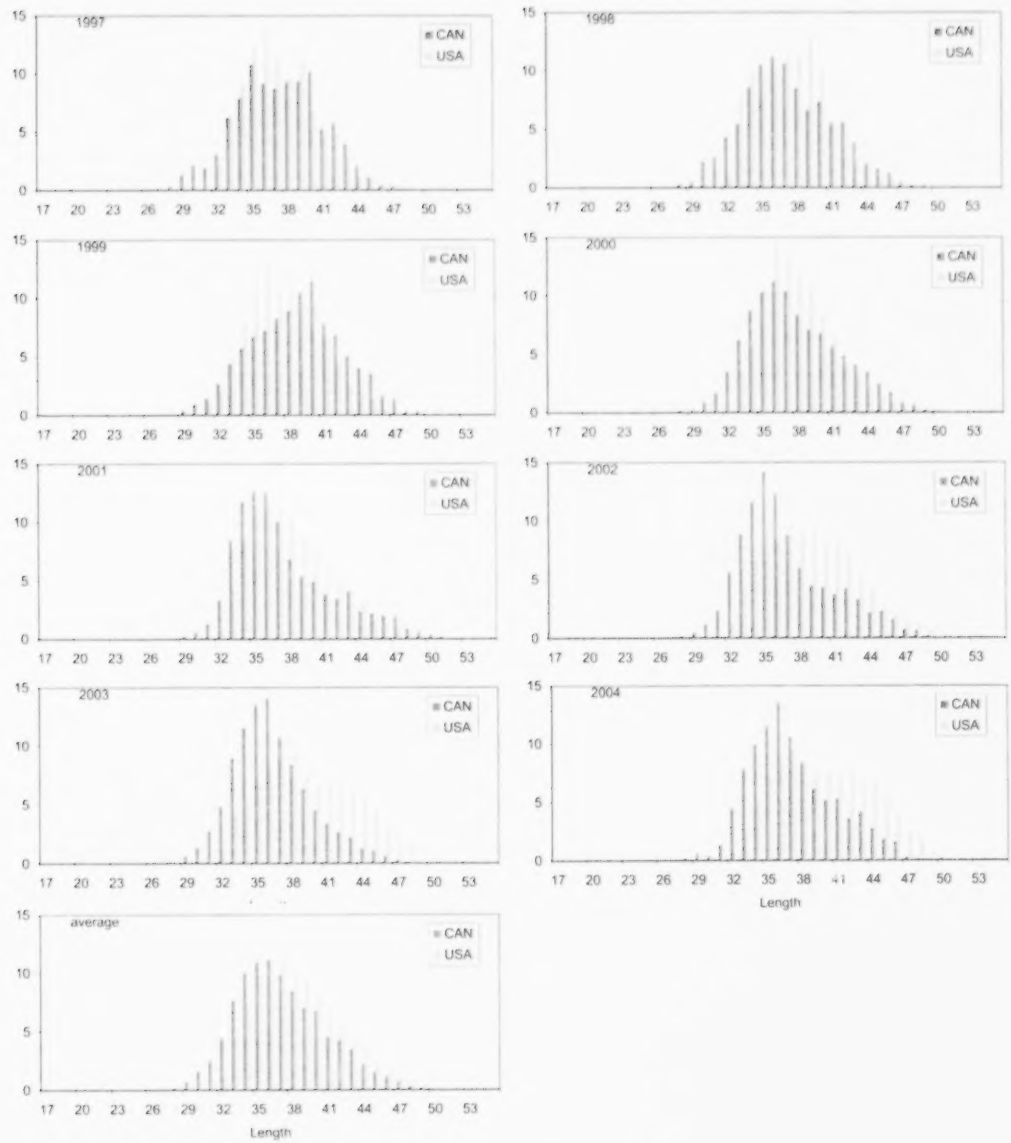

Figure 7. Comparison of the yellowtail flounder landings at size by Canada and USA on eastern Georges Bank for 1997-2004. The average landings at size are displayed in the bottom left panel.

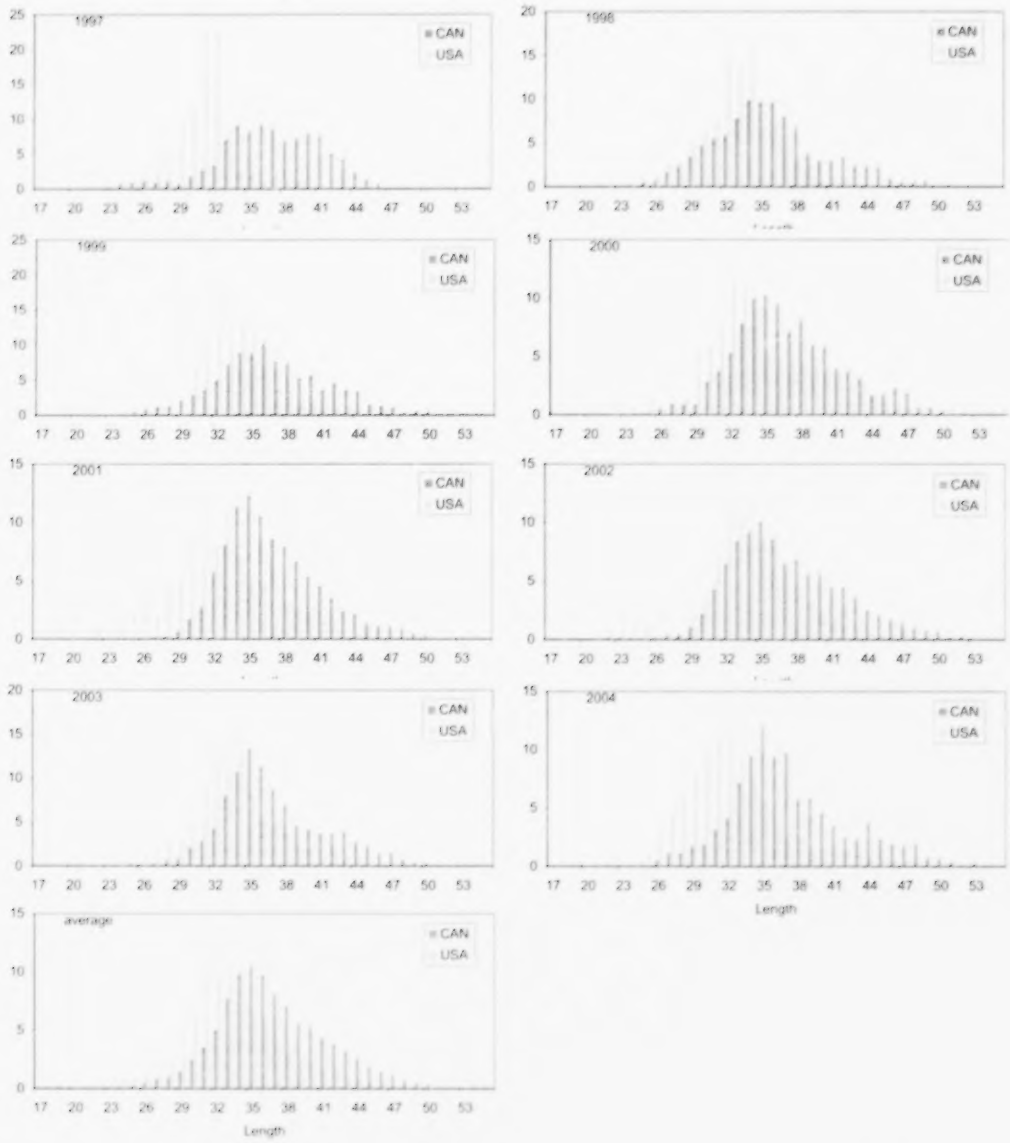

Figure 8. Comparison of the yellowtail flounder discards at size by Canada and USA on eastern Georges Bank for 1997-2004. The average discards at size are displayed in the bottom left panel.

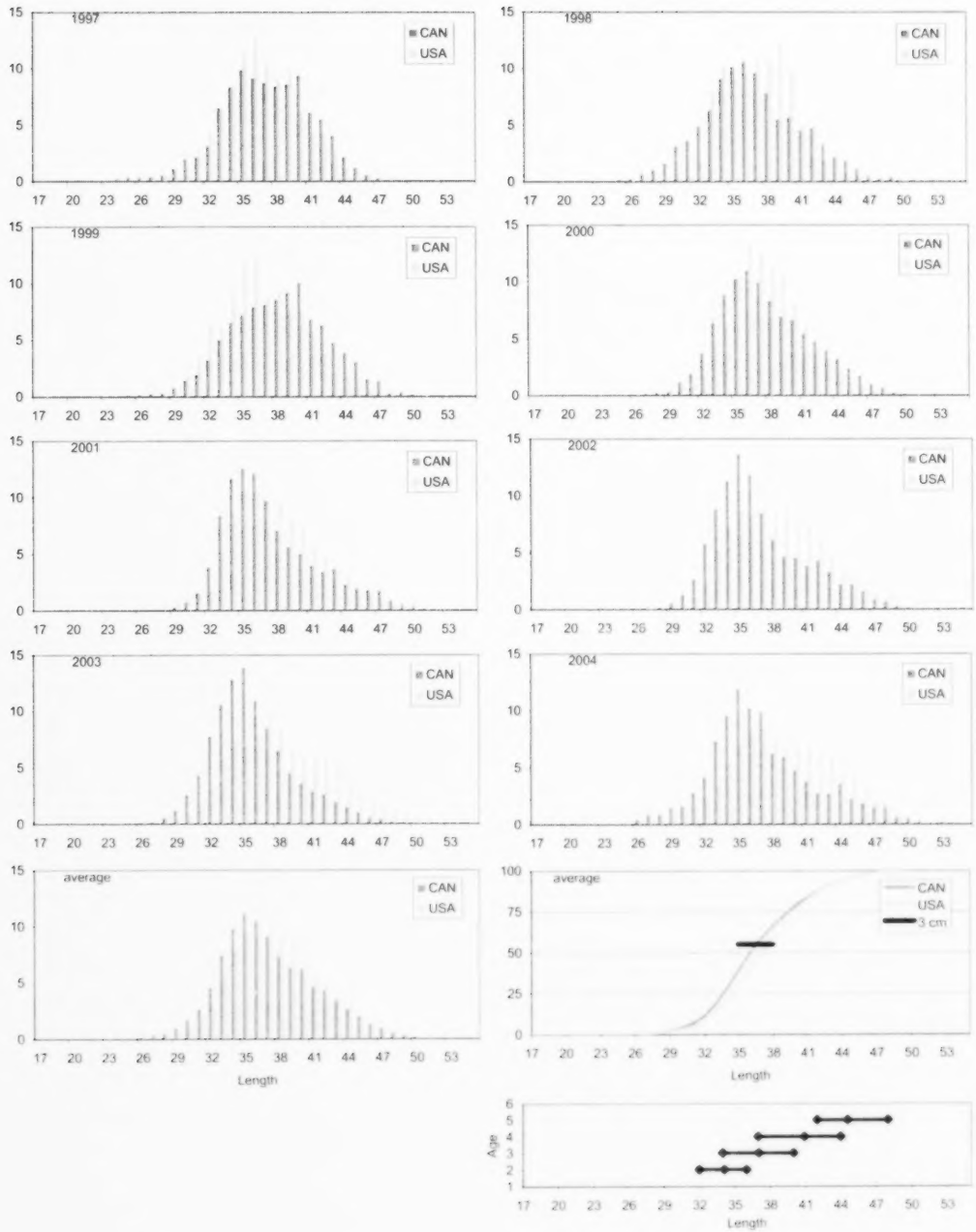

Figure 9. Comparison of the yellowtail flounder catch at size by Canada and USA on eastern Georges Bank for 1997-2004. The average catch at size and the average cumulative catch at size over these years are displayed in the bottom panels. To provide context for the potential implications on fishing mortality at age, the lower right panel shows the length range encompassing 80% of the cod at each of ages 3-6 for the 3rd quarter in 2005.